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Workplace assessment in the immunology department at Queen Alia Military Hospital

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Abstract:
A cross-sectional study was conducted at Queen Alia Military Hospitalin the immunology department to enhance the health posture of the technician in the laboratory. Photos and short videos were taken to investigate the technician posture while working in the immunoassay department, a questionnaire was distributed to find out the factors and parts of the body which influence by the task they do which shows that neck and head are the most parts affected by the job. The postural analyses were conducted by using RULA techniques, the result of the analysis shows that there is an actual problem which should be investigated.

Key Words: Job satisfaction, lifting, muscloskelstal pain, stress, vibration.

1. Introduction:

Lab testing should be more accurate and precise the best way is to use an automated system, but in some tests, manual method is used for testing, such as human immunodeficiency virus (HIV), hepatitis A virus, hepatitis B virus, and hepatitis C virus.

The enzyme-linked immunosorbent assay (ELISA) is the best and highly sensitive for these tests, where the ELISA technology detects antigens even if they are in very small quantities, this method requires using automated pipettes that accurately transfer small liquid volumes which should be speedily and smoothly when you press and release, depth immersion should be consistent and sufficient so the user must be highly concentrated and precise, the precision grip is formed between the tips of the thumb and fingers where more nerve-end concentrated that may cause injury [(3)] , and repetition is needed nearly vertical positioning of pipette so muscle exertions may lead to muscle disorders and fatigue also these tests need setting long time that can cause musculoskeletal disorders (MSDs), critical factors such as highly repetitive hand motions and awkward hand postures may cause injuries and musculoskeletal disorders[(12), (10)], many researchers found that even the design of common items and apparatus such as control handles, screw, knobs, and hand tools can affect the hand posture and leads to musculoskeletal disorders. [(6),(11),(4)].

For more precision use smaller pinch grip design of the handle to reduce contact pressure from outside of tool that will push skin and reduce blood flow, when grip span too big that will cause awkward posture, the grip strength loss when moving from nature posture that will cause compression of a nerve which leads to muscle weakness and poor circulation of blood, in wrist it causes pressure that compresses the tissue in the median nerve and causes carpal tunnel syndrome[(1),(5)].

The forearm contains muscles that provide grip strength, tendons connect muscles to fingers pass through the wrist, bending the wrist requires muscles work by tendons movement that will cause friction which reduces the potential strength of grip.

Adult head weight is between 10 and 12 pounds, looking down will increase the head weight, as the angle of looking increase the weight of head increase that will increase the stress load on the muscles and nerve neck, bending for a long period will cause poor posture and rounding shoulder, muscles of the neck will be shorter, and fatigue in the spine will occur because increase stress on discs will cause strain on the lower back that increased risk for slipped discs and cause neck and low back injuries. Backrest carries the weight of the upper trunk, arm, and head and allows muscles to relax; the sitting should support the natural lumbar curvature. Sitting is preferable than standing in more precise work that will increase stress on discs so increases pressure on the spinal column and that will affect the S-curve in the spine which activates muscles around the spinal column, absorbs the shocks, and protects the bones contains spinal nerves which transmit signals to and from the brain.

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This study aims to investigate MDS in Queen Alia Military Hospital in order to reduce injury for technicians.

2. Methods:

This study assesses the physical risk factors for MDS injury for lab technician in Queen Alia Military Hospital using an observational technique by taking photos and short videos because it's not allowed to take a full video for all the process, it's done especially in immunology department, this department is complex in nature, tests need time and technician should be accurate and precise, the task is done manually mainly.

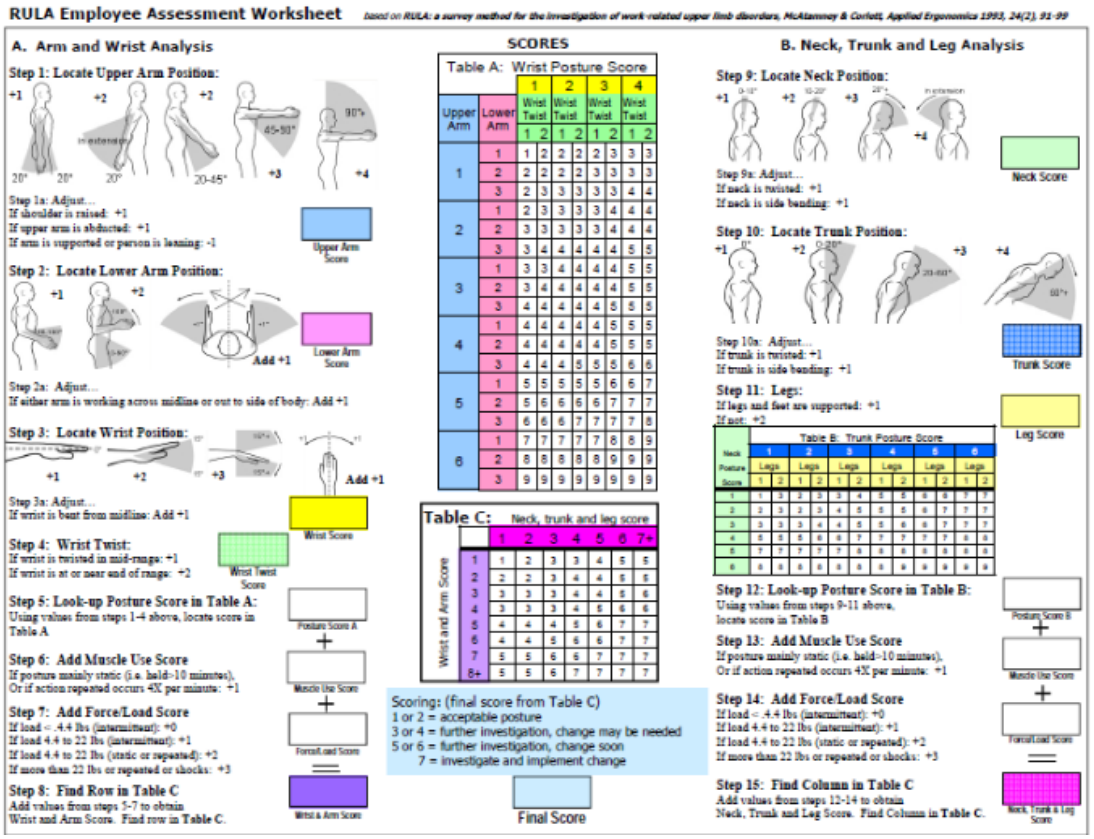
Assessment for individual technician by using Rapid Upper Limb Assessment (RULA) based on scoring to investigate body posture.

The questionnaire was conducted to investigate the Comfort and safety on the job site especially in this department since all other departments are fully automated.

2.1 Rapid Upper Limb Assessment (RULA)

It's an assessment tool considers biomechanical and postural load demand of job requirement, used to evaluate the exposure of individual workers to risk factors associated with upper extremity MSD, as shown in figure (1).

Figure (1)

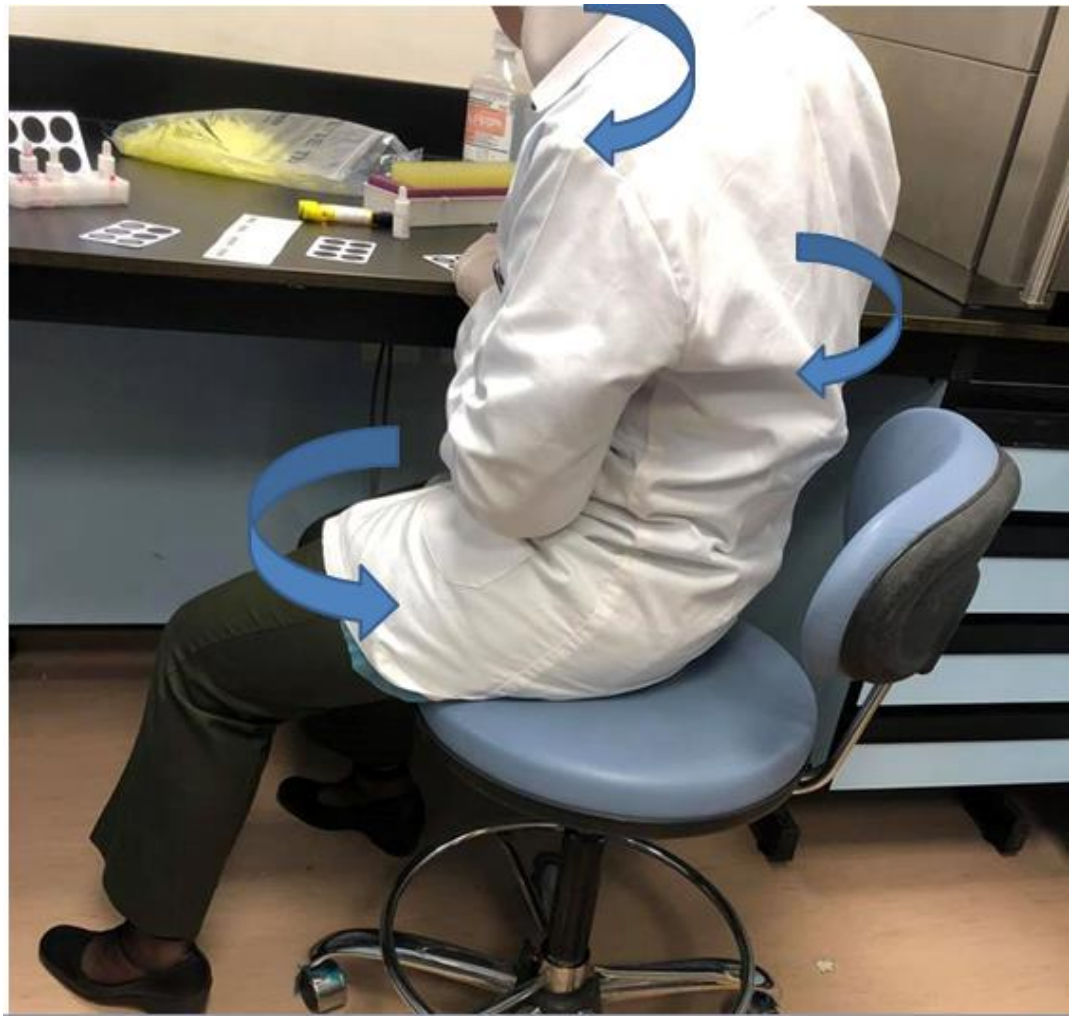


The technicians were observed and photos were taken during their work to determine the associated risks by RULA techniques, a rapid assessment of the loads on the musculoskeletal system of technician due to posture and muscle function, without using equipment.

RULA assessment is divided into two parts A and B, at which part A study the relationship between the arm and rest while part B between neck, trunk, and leg with the influence of force and muscle.

Analysis for the technician in figure (2) by using RULA technic was done from appendix A.1 the score for part A is 7, from the appendix A.2 the score for part B is 9, combining these results in appendix A.3 the total score is 7, which means that there is an actual problem that should be investigated implemented change for body posture.

Figure (2)



2.2Analysis:

This study was done in Queen Alia Military Hospital medical lab, the questionnaire was conducted on 27 laboratory technicians with ages ranging from 29 to 38 all technician was female and working in the same environment, the questionnaire consists of nine-question (shown in appendix B) that links the task with its effect on body parts.

The questionnaire is statistically analyzed by using excel that shows that technician in department of immunology facing head and neck problem caused by their task, the descriptive analysis was done using SPSS that shows the validity and the reliability of the questionnaire.

3. Discussion and conclusions:

Several studies examined the effect of the workplace on the laboratory technician's disorder.

A standardized Nordic Musculoskeletal Questionnaire was administered in Sydney, Australia, to evaluate the prevalence, site, and impact of work-related musculoskeletal problems found that lower back (27.3%), neck (23.6%), upper back (20.0%), and shoulders (15.5%).[(14)]

A study was conducted in Mumbai hospitals using 49 laboratory technicians working in the department of laboratory by using the Quick Exposure Checklist analysis showed that the neck (93.4%) , the wrist (69.1%), back (62.7%) and shoulder (54.3%).[(16)]

Our study result shows that (78%) head or neck, (70%)wrist and elbow and shoulder (67 %) .

Which means that the previous studies and our study agreed with each other's on the founding that technicians suffered from neck disorder more than wrist and shoulder.

The posture of the technician in figure (2) was analyzed by the RULA method as shown in appendix A.1 and A.2 and the score result in appendix A.3 found that the technician facing a problem that should be investigated.

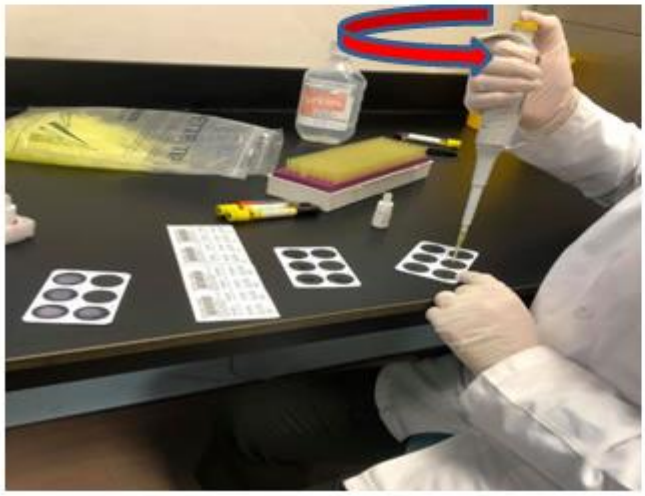
The technician'sposture was investigated by direct observation during their work, several photos and short videos were taken to achieve complete and accurate data as shown below:

Figure (3)

High contact area at the edge of chair, the feet are not rested 90° that will affect blood flow and cause numbness.

The technician in this picture tilt seat pan forward to reduce back strain, weight of leg pull is down word increase pressure contact at the edge of the chair so poor of blood circulation occurs.

Precision causes muscle contraction that leads to finger dystonia.



Pipetting cause vibration, blood vessels constrict that affect the blood supply to the nerve in the finger which will cause Hand-arm vibration syndrome.

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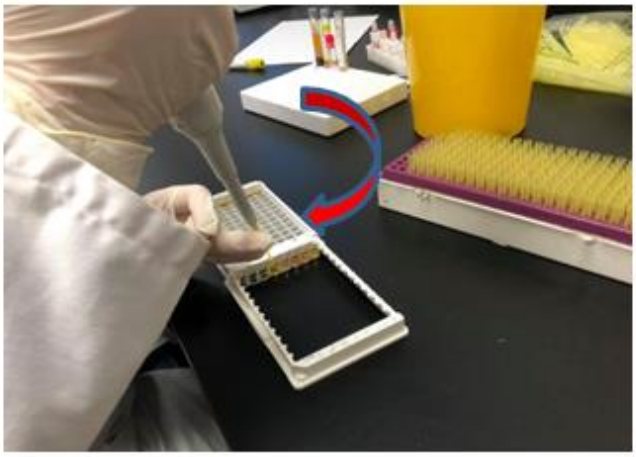

Pipit should not immerse in the plat, to prevent contamination that will cause bending on the back to increase adjusting the vision which causes stress on the disc that presses on the nerve of the spine and cause back and neck pain.

Repetitive adjustment tool causes awkward posture cause compression of a nerve which leads to muscle weakness and poor circulation of blood in the wrist, it causes pressure that compresses the tissue in the median nerve and causes carpal tunnel syndrome to the nerve in the finger which will cause Hand-arm vibration syndrome

The questionnaire was conducted to investigate the comfort and safety on the job site especially in this department since all other departments are fully automated.

The statistical analysis of the questionnaire shows that 78% of the lab technicians very often have awkward head or neck position, 74% for task require repetition, 70% have awkward bend besides,70% compline that the tasks are performed at embarrassing wrist angle for a long period of time and 67 % that task is performed at an embarrassing elbow angle also for a long period of time, finally and not surprising only 4% said that task needs force and the analysis shows that vibration has no effect.

Lab in Queen Alia Hospital was designed for sitting and standing at height 900 mm, according to lab design nominal heights of 750mm & 900mm, correction in bench design should be achieved in this department, sitting and standing bench design is suitable for bench top equipment not for manual tasks.

The study was conducted in a suitable light and environment with determining gender and age group but face-to-face interviews to get information about the health history of technicians wasn't obtained.

4. Recommendation:

Improving the posture is essential always and everywhere, whenever and wherever, bending forward to work produce tired in the neck, shoulders, and arms very quickly so change the body position while working will increase blood flow and reduce fatigue.

Frequent rest is essential not only to recuperate from fatigue but also to prevent it.

Technician visual acuity should check regularly in this type of works which required always attending and caring for more precise works.

While handling with hand tool avoids contact pressure from outside of the tool that affected the pressure-flow and cause injury.

Body mass index should be considered in future studies because weight and deformity affect sitting work.

Face-to-face interviews should be conducted to get information about the health history of technicians to exclude any factor that may affect the study.

Lab design should be modified in the immunology department and not restricted at the upper specification of lab design to be more comfortable to the technicians.

In a further study, all hospitals in Royal Medical Services should be included, so that more technicians will participate in, that will make the questionnaire more sufficient and appropriate.

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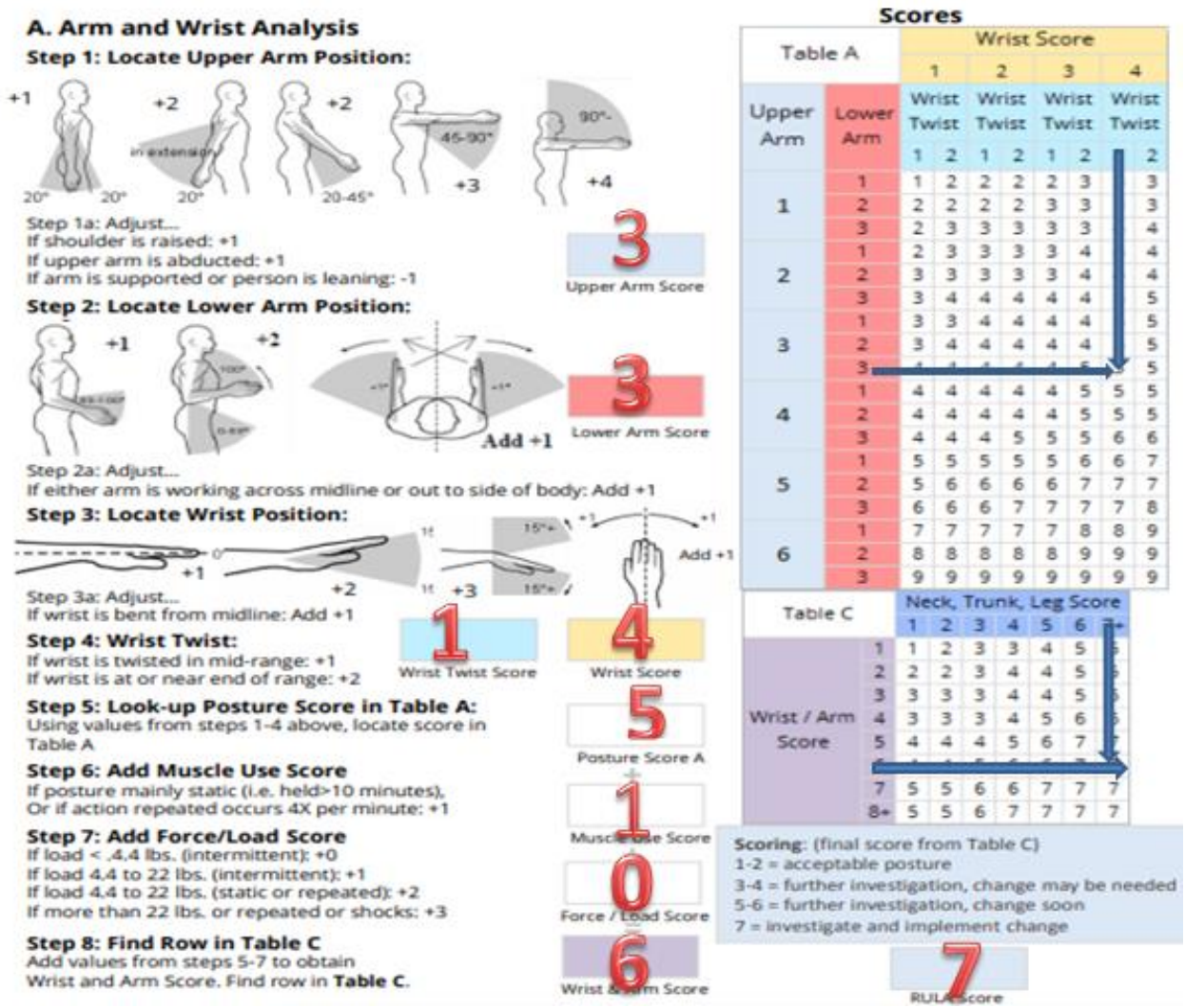
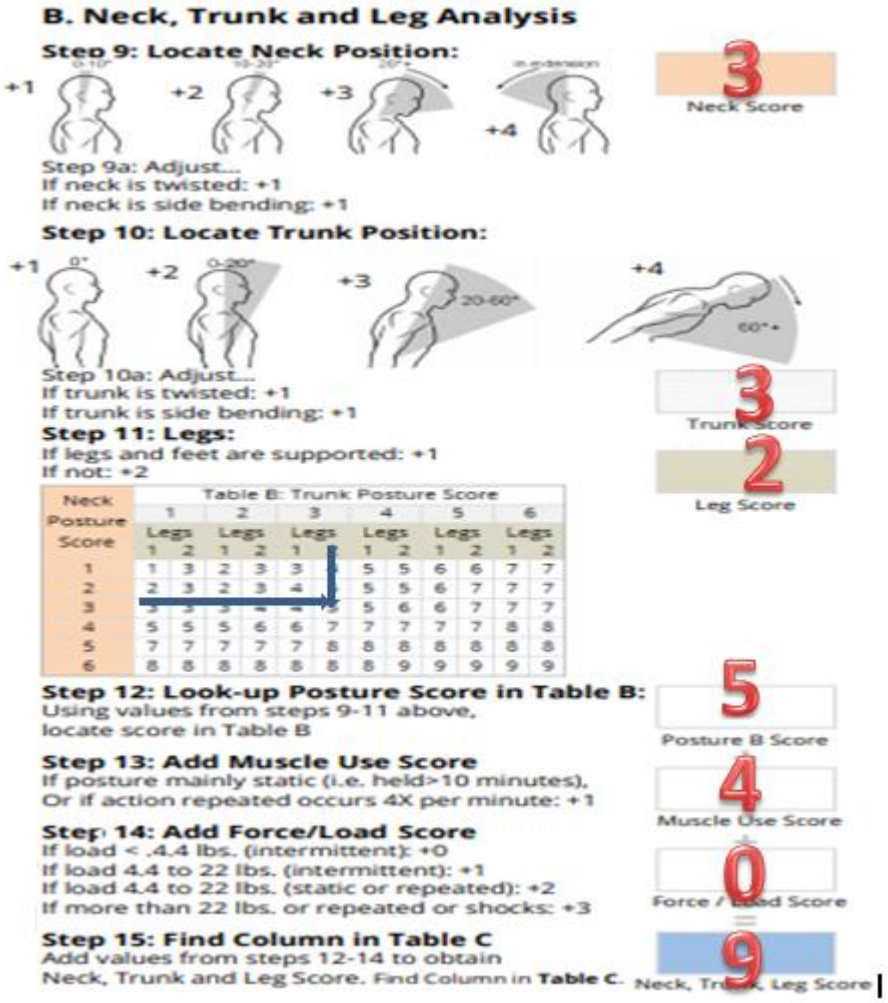
Appendix A

A.1



A.2


B. Neck, Trunk and Leg Analysis
Step 9: Locate Neck Position:
+1
+2
+3
+4
3
Neck Score
Step 9a: Adjust...
If neck is twisted: +1
If neck is side bending: +1
Step 10: Locate Trunk Position:
+1
+2
+3
+4
20-60°
60°+
Step 10a: Adjust...
If trunk is twisted: +1
If trunk is side bending: +1
3
Trunk Score
Step 11: Legs:
If legs and feet are supported: +1
If not: +2
2
Leg Score
Table B: Trunk Posture Score
Neck Posture Score
Step 12: Look-up Posture Score in Table B:
Using values from steps 9-11 above,
locate score in Table B
5
Posture B Score
Step 13: Add Muscle Use Score
If posture mainly static (i.e. held>10 minutes),
Or if action repeated occurs 4X per minute: +1
4
Muscle Use Score
Step 14: Add Force/Load Score
If load < 4.4 lbs. (intermittent): +0
If load 4.4 to 22 lbs. (intermittent): +1
If load 4.4 to 22 lbs. (static or repeated): +2
If more than 22 lbs. or repeated or shocks: +3
0
Force / Load Score
Step 15: Find Column in Table C
Add values from steps 12-14 to obtain
Neck, Trunk and Leg Score. Find Column in Table C.
9
Neck, Trunk, Leg Score

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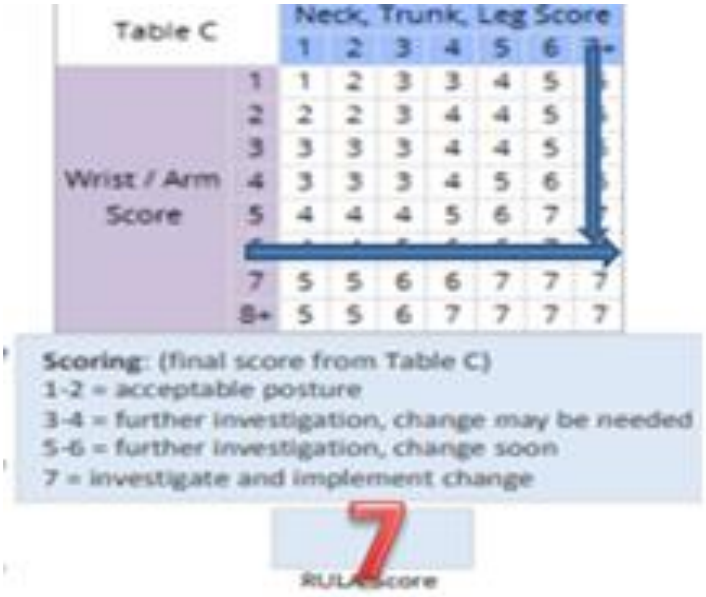
A.3



Appendix B

Question	Never	Seldom	Sometime	often	Very often
1. task required repetition					
2.using embarrassing tools					
3.tasks caused awkward head or neck position for long period of time					
4. task require awkward bend for long periods of time					
5.task is performed at an embarrassing elbow angle for long period of time					
6.tasks are performed at embarrassing wrist angle for long period of time					
7.tasks perform with long sitting period of time					
8.high vibration producing tools used routinely					
9.task need force					

Appendix C:

Statistical Analysis:

Question #	n	Very Often	Often	Sometimes	Seldom	Never	Total
repetition	27	74%	26%	0%	0%	0%	**100%**
tools	27	56%	22%	22%	0%	0%	**100%**
head or neck	27	78%	22%	0%	0%	0%	**100%**
bend	27	70%	22%	8%	0%	0%	**100%**
elbow	27	67%	26%	7%	0%	0%	**100%**
wrist	27	70%	30%	0%	0%	0%	**100%**
sitting	27	63%	30%	7%	0%	0%	**100%**
vibration	27	0%	15%	11%	48%	26%	**100%**
force	27	4%	0%	0%	52%	44%	**100%**

Notes:

Output Created		suhad
Comments		
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	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	27
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	All non-missing data are used.
Syntax		DESCRIPTIVES VARIABLES=Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 /STATISTICS=MEAN SUM STDDEV VARIANCE RANGE MIN MAX SEMEAN KURTOSIS SKEWNESS /SORT=MEAN (A).
Resources	Processor Time	00:00:00.015
	Elapsed Time	00:00:00.047

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[DataSet1]

Descriptive Statistics:

	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Q9	27	3	1	4	46	1.70	.176	.912	.832	.981	.448	-.184-	.872
Q8	27	4	1	5	77	2.85	.205	1.064	1.131	-.098-	.448	-.636-	.872
Q2	27	2	3	5	116	4.30	.158	.823	.678	-.623-	.448	1.227-	.872
Q7	27	2	3	5	124	4.59	.144	.747	.558	1.536-	.448	.762	.872
Q6	27	2	3	5	128	4.74	.101	.526	.276	1.985-	.448	3.462	.872
Q1	27	0	5	5	135	5.00	.000	.000	.000	.	.	.	.
Q3	27	0	5	5	135	5.00	.000	.000	.000	.	.	.	.
Q4	27	0	5	5	135	5.00	.000	.000	.000	.	.	.	.
Q5	27	0	5	5	135	5.00	.000	.000	.000	.	.	.	.
Valid N (list wise)	27												

```
RELIABILITY
  /VARIABLES=Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
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Reliability:

Notes

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Comments		
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Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.016
	Elapsed Time	00:00:00.012

[DataSet1]

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	27	100.0
	Excluded	0	.0
	Total	27	100.0

a. List wise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.044	9

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